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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/520,816	01/07/2005	Susumu Matsumoto	71971-109	4853
20277 7590 10/18/2007 MCDERMOTT WILL & EMERY LLP 600 13TH STREET, N.W. WASHINGTON, DC 20005-3096			EXAMINER MATTHEWS, COLLEEN ANN	
			ART UNIT 2811	PAPER NUMBER
			MAIL DATE 10/18/2007	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/520,816

Applicant(s)

MATSUMOTO ET AL.

Examiner

Colleen A. Matthews

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 August 2007.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-11 and 13-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-11 and 13-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.



LYNNE GURLEY

SUPERVISORY PATENT EXAMINER

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____

- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date: _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Priority

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 3-6, 8-11 and 13-15 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Pub. No. 2003/0001273 to Steiner et al. (Steiner).

Regarding claim 1, Steiner discloses an electronic device comprising:

a low dielectric constant (Figure 6 42, paragraph 19 lines 20-21) film having a hole (90) and a trench (82) formed in at least an upper portion of the low dielectric constant film to be connected with the hole;

a nitrogen-non-containing insulating film (36, paragraph 22) formed under the low dielectric constant film; and

a nitrogen-containing insulating film (30, paragraph 20 lines 4-8) formed under the nitrogen-non-containing insulating film,

wherein at least a part of the trench (82) is located in the same low dielectric constant film (42) where the hole (90) is formed.

Regarding claim 3, Steiner discloses the device of claim 1, where the lower surface of the low dielectric constant film (42) is in contact with the upper surface of the nitrogen-non-containing insulating film (36).

Regarding claim 6, Steiner discloses an electronic device comprising:

a low dielectric constant (Figure 6 42, paragraph 19 lines 20-21) film having a hole (90);

a nitrogen-non-containing insulating film (48) formed over the low dielectric constant film; and

a nitrogen-containing insulating film (54) formed over the nitrogen-non-containing insulating film,

wherein a trench (82), which is connected with the hole (90) is formed in the nitrogen-containing insulating film (54) and at least an upper portion of the low dielectric constant film (42), and

at least a part of the trench is located in the same low dielectric constant film (42) where the hole (90) is formed.

Regarding claim 11, Steiner discloses an electronic device comprising:

a low dielectric constant film (42, paragraph 19 lines 20-21) having a hole (90);

a first nitrogen-non-containing insulating film (36, paragraph 22) formed under the low dielectric constant film; and

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a second nitrogen-non-containing insulating film (48, paragraph 22) formed over the low dielectric constant film,

wherein a trench (82), which is connected with the hole (90), is formed in the second nitrogen-non-containing insulating film (48), at least a part of the trench (82) is located in the same low dielectric constant film (42) where the hole (90) is formed, and

the lower surface of the low dielectric constant film (42) is in contact with the upper surface of the first nitrogen-non-containing insulating film (36).

Regarding claims 4-5, 9-10 and 14-15, Steiner discloses the device of claims 1, 6 and 11, where the low dielectric constant film is a carbon-containing silicon oxide film or a porous film (paragraph 19 lines 20-21). Steiner further discloses the carbon-containing silicon oxide film as a SiOC film (paragraph 19 lines 20-21).

Regarding claim 8, Steiner discloses the device of claim 6, where the upper surface of the low dielectric constant film (42) is in contact with the lower surface of the nitrogen-non-containing insulating film (48).

Regarding claim 13, Steiner discloses the device of claim 11, where the upper surface of the low dielectric constant film (42) is in contact with the lower surface of the second nitrogen-non-containing insulating film (48).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S.

Pub. No. 2003/0001273 to Steiner et al. (Steiner) in view of Applicant's Admitted Prior Art (AAPA) of Figure 3 and 4a-4f and specification pages 27-32.

Regarding claim 2, Steiner discloses the device of claim 1, where the hole (90) passes through the nitrogen-non-containing insulating film (36) and the nitrogen-containing insulating film (30). Steiner lacks disclosing the device further including a lower-level interconnect which is located under the hole and connected with the hole, and the upper surface of the lower-level interconnect, except for a region in which the lower-level interconnect is connected with the hole, is covered with the nitrogen containing insulating film.

The AAPA of Figures 3 and 4A-4F discloses a device including a lower-level interconnect (22) which is located under the hole (27) and connected with the hole, and the upper surface of the lower-level interconnect, except for a region in which the lower-level interconnect is connected with the hole, is covered with the insulating film (23).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Steiner to include a lower-level interconnect under the hole as in the AAPA in order to provide electrical connection to other circuitry.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S.

Pub. No. 2003/0001273 to Steiner et al. (Steiner) in view of U.S. Pub. No.
2002/0102779 to Yang.

Regarding claim 7, Steiner discloses the device of claim 6. Steiner lacks disclosing the nitrogen-containing insulating film is an anti-reflection film.

Yang teaches a nitrogen-containing insulating film (Fig 2F element 210, paragraph 21) as an anti-reflection film formed over a dielectric film. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Steiner to have the nitrogen-containing insulating film as an anti-reflection film as in Yang in order to limit reflection during patterning.

Claims 16-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Pub. No. 2003/0001273 to Steiner et al. (Steiner) in view of U.S. Pat. No. 6,087,729 to Cerofolini et al. (Cerofolini) and Applicant's Admitted Prior Art (AAPA) of Figure 3 and 4a-4f and specification pages 27-32.

Regarding claim 16, Steiner discloses an electronic device comprising:
a low dielectric constant film (Figure 6 42, paragraph 19 lines 20-21) having a hole (90), and
an insulating film (54) formed over the low dielectric constant film,
wherein a trench (82), which is connected with the hole, is formed in the insulating film and at least an upper portion of the low dielectric constant film is filled with an interconnect (paragraph 0027 lines 34-38), and

a bottom of the trench (82) is located in low dielectric constant film.

Steiner fails to disclose the insulating film as a low density insulating film having a film density of 1.3 g/cm^3 or lower. Cerofolini discloses a low density insulating film in an electronic device having a film density of 1.3 g/cm^3 or lower (between 0.002 and 1 g/cm^3 col 5 lines 28-30). It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Steiner to have the insulating film a low density insulating film having a film density of 1.3 g/cm^3 or lower in order to fabricate integrated circuits having a high density of integration with improved properties, such as the insulating film having improved temperature stability.

Steiner fails to disclose the bottom of the trench (82) located in the middle portion of the vertical direction of the dielectric film. AAPA discloses a device including a low dielectric constant film (Figure 3 element 24) and a trench (27) where the bottom of the trench is located in the middle portion of the vertical direction of dielectric film. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Steiner to the bottom of the trench located in the middle portion of the vertical direction of the dielectric film as in the AAPA in order to provide metal interconnects for connection to other circuitry.

Regarding claim 17, Steiner as modified discloses the device of claim 16, as above. Steiner further discloses the insulating film (54) containing Nitrogen (paragraph 20 lines 4-8).

Regarding claim 18, Steiner discloses the device of claim 16. Steiner further discloses a nitrogen-containing insulating film (30, paragraph 20 lines 4-8) formed under the low dielectric constant film (42).

Regarding claims 19-20, Steiner as modified discloses the device of claim 16, as above. Steiner further discloses the low dielectric constant film (42) as carbon-containing silicon oxide film, where it is a SiOC film, or a porous film (paragraph 19 lines 20-21).

Response to Arguments

Applicant's arguments, see page 7, filed 08/07/2007, with respect to the Huang reference being disqualified as prior art due to submission of a certified English translation of JP 2003-104499 have been fully considered and are persuasive. The 35 U.S.C 103(a) rejection of claims 16-20 have been withdrawn.

Applicant's arguments, see page 7, filed 08/07/2007, with respect to the AAPA not having the lower surface of the low dielectric constant film in contact with the first nitrogen-non-containing insulating film as required by the amended claim 11 have been fully considered and are persuasive. The 35 U.S.C 102(a) rejection of claims 11 and 13-15 have been withdrawn.

Applicant's remaining arguments filed 08/07/2007 have been fully considered but they are not persuasive. Applicant argues with regard to claims 1, 6, and 11 that Steiner's hole 78 and trench 82 are formed in different low dielectric constant films. This point is moot because in the rejection in the last action and above the hole is element

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90 (not 78) and the hole 90 and trench 82 are both formed in the same low dielectric constant film (42).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Colleen A. Matthews whose telephone number is 571-272-1667. The examiner can normally be reached on Monday - Friday 8AM-4:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lynne Gurley can be reached on 571-272-1670. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

CAM
10/14/2007


LYNNE GURLEY
SUPERVISORY PATENT EXAMINER
Av 2811, TC 2800